REMARKS

Claims 1-10 and 21-30 were presented.

Claims 1-4, 6, 8 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,199,000 to Keller et al. (hereinafter "Keller") in view of U.S. Patent No. 6,454,036 to Airey et al. (hereinafter "Airey"). Claims 5, 9 and 10 were rejected under 35 U.S.C. §103(a) as being unpatentable over Keller in view of Airey and further in view of U.S. Patent No. 5,974,347 to Nelson (hereinafter "Nelson"). Claims 21-23, 28 and 30 were rejected under 35 U.S.C. §103(a) as being unpatentable over Keller in view of Airey and further in view of US Patent No. 6,810,324 to Nadkarni (hereinafter "Nadkarni"). Claim 25 was rejected under 35 U.S.C. §103(a) as being unpatentable over Keller in view of Airey and further in view of US Patent No. 6,459,955 to Bartsch et al. (hereinafter "Bartsch"). Claim 26 was rejected under 35 U.S.C. §103(a) as being unpatentable over Keller in view of Airey and further in view of Bartsch and further in view of US Patent Application Publication No. 2002/0019696 to Kruse (hereinafter "Kruse"). Claim 27 was rejected under 35 U.S.C. §103(a) as being unpatentable over Keller in view of Airey and further in view of Bartsch and further in view of US Patent Application Publication No. 2002/0193121 to Nowak et al. (hereinafter "Nowak"). Claim 29 was rejected under 35 U.S.C. §103(a) as being unpatentable over Keller in view of Airey and further in view Nadkarni and further in view of Bartsch.

Claim 24 was objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

General Comment on the Detailed Office Action

Applicant notes that the detailed portion of the Final Office Action is essentially a verbatim reiteration of the detailed Final Office Action in the co-pending U.S. application Serial No. 10/401,266, which Final Office Action was issued on August 24, 2005. The detailed portion of each of the two Office Actions appear to be verbatim copies of each other down to the typographical errors.

Even though there is an additional limitation (which begins with the words "an environmental signal detection module") in independent claim 1 of the present application relative to independent claim 1 in co-pending US application serial No. 10/401,266, the Detailed Action portion of the Office Action does not discuss or explain any basis for rejection of the environmental signal detection module.

As Applicant pointed out in the response to the previous Office Action, claim 7 is included in the list of rejected claims in the Office Action Summary, the Detailed Action portion makes no reference at all to pending claim 7, and presents not a single argument as to why claim 7 is rejected. Applicant notes that claim 7 is pending in the present application and claim 7 of the co-pending US application serial No. 10/401,266 was cancelled. Pending claim 7 recites "The programmable robotic apparatus of Claim 1, wherein said environmental signal detection module is configured to discern at least one of a location and an orientation relative to at least one of a **cellular telephone communication antenna, a radio broadcast antenna, and a television broadcast antenna**." (emphasis added)

> In some instances, for example with regard to claim 25, the rejection asserts an outcome that has nothing to do with the language of the claim. The Detailed Action at the last three lines of page 7 states, "Therefore, it would have been obvious to one skill [sic, skilled] in the art to combine Keller's invention with Bartsch's external control guidance in order to reduce the workload of working families by performing useful tasks, capable of easily being trained." Claim 25 recites nothing about the workload of working families.

Response to Rejection of Claims 1-4, 6-8 under 35 U.S.C. §103(a)

Claims 1-4, 6, and 8 were rejected under 35 U.S.C. §103(a) as being unpatentable over Keller in view of Airey. Airey is a new reference first cited by the Examiner in the present Office Action, and argued by the Examiner as being combinable with Keller. In the present application, the Examiner first cited Keller as being a "functional equivalent" of a compass module, and now is attempting to cite Airey as anticipating the compass module on the basis "that it would have been obvious for one [sic, of] skill in the art to combine Keller's

invention with Airey's directional components in order to direct the proportion and direction of power delivered to the driving wheel, keeping the vehicle on the predetermined path."

Applicant is puzzled as to why anyone would want "to combine Keller's invention with Airey's directional components." Keller uses GPS as a navigational system. As Applicant has previously explained, magnetic fields have directional components, which can be represented as vectors if one wishes to visualize the field. By comparison, the signal broadcast by a GPS satellite does not involve directional components of fields, but rather uses digitally encoded time signals, which have no connection whatsoever with any magnetic field, are not responsive to a magnetic field, and operate acceptably in the absence of a magnetic field. Applicant does not understand why adding magnetic components to Keller's invention would have any utility or would be desirable other than to attempt to disallow the present application. This proposed combination has not been explained by the Examiner, neither as to how or why it would work, nor as to how it is motivated by some teaching other than that of the Applicant. According to the Examiner, it is "obvious."

In co-pending US application serial No. 10/401,266, claims 1-4, 6 and 8 were rejected by the same Examiner using the identical argument, claim 7 having been previously cancelled. However, the present independent claim 1 includes a limitation not found in any of the claims of the co-pending US application serial No. 10/401,266.

Applicant respectfully notes that the Examiner has not addressed the claim limitation indicated in bold below, which will be referred to hereinafter as "the environmental signal detection module limitation," and therefore appears to have made a rejection without indicating where and in what art the claim limitation indicated in bold is taught. It appears that the Examiner has again failed to address the presence of the additional limitation even after receiving Applicant's response to the previous Office Action, which also made note of the absence of a reason for finding the limitation in the prior art cited.

Claim 1 of co-pending US application serial No. 10/401,266 presently recites:

A programmable robotic apparatus, comprising:

a drive system comprising a plurality of independently operable treads;

a control module in electrical communication with said drive system, said control module configured to command the operation of each tread;

a memory module in electrical communication with said control module, said memory module configured to store and retrieve information; and

a compass module in electrical communication with said control module, said compass module configured to discern an orientation of said programmable robotic apparatus, wherein said compass module is configured to discern an orientation relative to the magnetic field of the planet Earth based on an analysis of at least one directional component of said magnetic field.

Claim 1 in the present application recites the language presented below. The added limitation relative to claim 1 of the co-pending U.S. application Serial No. 10/401,266 is indicated in **bold** typeface.

A programmable robotic apparatus, comprising:

a drive system comprising a plurality of independently operable treads;

a control module in electrical communication with said drive system, said control module configured to command the operation of each tread;

a memory module in electrical communication with said control module, said memory module configured to store and retrieve information;

an electronic compass module in electrical communication with said control module, wherein said electronic compass module is configured to discern an orientation relative to the magnetic field of the planet Earth based on an analysis of at least one directional component of said magnetic field; and

an environmental signal detection module in electrical communication with said control module, wherein said environmental signal detection module is configured to detect an environmental signal of terrestrial origin that is

provided for purposes of communication and to discern at least one of a location and an orientation of said programmable robotic apparatus.

Applicant has previously pointed out that Keller fails to teach or suggest the use of "an environmental signal detection module in electrical communication with said control module, wherein said environmental signal detection module is configured to detect an environmental signal of terrestrial origin that is provided for purposes of communication and to discern at least one of a location and an orientation of said programmable robotic apparatus."

In the previous response, Applicant has addressed at length why Keller does not teach or suggest the present invention. Applicant's remarks concerning Keller in the previous response are incorporated by reference herein in their entirety, and are repeated in part to provide context for the further remarks made herein.

Keller never explicitly describes the magnetic field of the planet Earth as a suitable signal from which to derive a location or a direction. Furthermore, from the disclosure of Keller cited above, it is clear that "GPS" systems are the primary locating system used in the invention of Keller, and other systems are provided as SUPPLEMENTAL systems, and not as the principal navigational system of Keller's invention. Keller does not teach or suggest how a system would operate without the "GPS" system he uses as the primary locating system, nor does Keller explain how to use such a system in the absence of the primary "GPS" system.

Claim 1 recites, in relevant part:

A programmable robotic apparatus, comprising:

...

an electronic compass module in electrical communication with said control module, wherein said electronic compass module is configured to discern an orientation relative to the magnetic field of the planet Earth based on an analysis of at least one directional component of said magnetic field.

The MPEP at §2143 Basic Requirements of a *Prima Facie* Case of Obviousness explains that:

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.
>
> The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

The MPEP also explains that:

> "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985).

The MPEP also explains that:

> When the motivation to combine the teachings of the references is not immediately apparent, it is the duty of the examiner to explain why the combination of the teachings is proper. *Ex parte Skinner*, 2 USPQ2d 1788 (Bd. Pat. App. & Inter. 1986).

The MPEP at §2141.02, PRIOR ART MUST BE CONSIDERED IN ITS ENTIRETY, INCLUDING DISCLOSURES THAT TEACH AWAY FROM THE CLAIMS, requires that:

> A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984)

1. Airey teaches and claims the combined use of a three axis magnetometer and a three axis accelerometer.

Airey teaches an autonomous vehicle navigation system and method. In the Abstract, Airey teaches that "This invention uses **the Earth's magnetic and gravitational fields** for directional vectors and uses **optical shaft encoders mounted on a non-driving wheel** to accurately measure the distance traveled." (emphasis added) In Fig. 2 of Airey, there are shown both the presence of a three axis magnetometer and a three axis accelerometer. Independent claims 1 and 9 of Airey recite both "the three components of the earth's magnetic field" and "the three components of the earth's gravitational field." Nowhere in Airey is there a teaching or a suggestion of using the earth's magnetic field without using the earth's gravitational field as well.

Airey repeatedly makes reference to the necessity of using three kinds of sensors in his invention. At column 2, lines 39-46, Airey teaches:

> The invention uses three onboard sensor groups for navigation. The first of these sensors measures the distance traveled by the vehicle along its forward axis. The second and third sensor groups detect the earth's magnetic and gravitational fields. Because the orientation sensors make use of naturally occurring phenomena, this invention does not require externally placed emitters or buried objects, or environmental conditioning of any kind.

Airey teaches at column 3, lines 19-23, that:

> A three axis magnetometer measures the direction and magnitude of the Earth's magnetic field. That is, three magnetometers are positioned at orthogonal angles to provide a three dimensional vector that gives the direction of the naturally occurring field.

Additionally, with respect to the three axis accelerometer, Airey teaches at column 3, lines 28-38, that:

> A three axis accelerometer measures the direction and magnitude of the force of gravity. It is constructed from a set of three accelerometers positioned at orthogonal angles. Like the magnetometers, the important aspect of this sensor is that it gives a repeatable vector that is constant with respect to Earth. An unwanted side-effect of accelerometers for this application is that they also measure any inertial change in the vehicle. However, using the information from the optical shaft encoders attached to the vehicle's wheels, the effects of

> inertial changes can be cancelled from the sensor yielding a constant gravitational vector.

Airey explains in detail the mathematical underpinning and the computational procedures used in his system generally at column 4, line 63, through column 6, line 17. At column 4, line 63, through column 5, line 2, Airey explains that:

> In the following discussion, a coordinate system is an ordered triple of three linearly independent vectors, called basis vectors. In FIG. 4 we see the two coordinate systems which are relevant to the invention. The world coordinate system (FIG. 4A), consists of three unit vectors, N 22, E 20 and G 21, nominally indicating North, East, and the direction of the Earth's center, respectively.

Applicants note for the record that Airey uses the term "consists of," and not the term "comprises," which means that in Airey's system there must be three unit vectors to describe the "world coordinate system," not more and not less.

Airey also teaches about the coordinate system of his apparatus, at column 5, lines 2-10, that:

> The second coordinate system (FIG.4B), is the vehicle coordinate system, also consisting of three vectors. The unit vector, F 18, points in the forward direction of the chassis 19. The unit vector, R 16, points to the right of vector F 18 and unit vector, D 17, points straight down from the chassis 19. The world coordinate system is fixed, while the vehicle coordinate system changes from moment to moment as the vehicle travels through the world.

Again, Applicants note for the record that Airey uses the term "consists of," and not the term "comprises," which means that in Airey's system there must be three unit vectors to describe the "vehicle coordinate system," not more and not less.

Airey then teaches how one measures the magnetic and gravitational fields. At column 5, lines 16-22, Airey teaches:

> The first vector is provided by the Earth's magnetic field, which has a direction and magnitude. The second is the Earth's gravitational field which also has a direction and magnitude. Both fields are easily measured by conventional transducers. FIG. 5 shows how the earth's magnetic and gravitational field vectors, C 23 and G 24 respectively, are seen in the context of the vehicle.

Airey further teaches at column 5, lines 34-36 the decomposition of the magnetic vector: "FIG. 6 shows how the magnetic vector 23 is decomposed into a forward vector 27, a right vector 26 and a downward vector 25 by the sensors." At column 5, lines 38-40, Airey teaches the decomposition of the gravitational vector: "FIG. 7 shows how the forward 30, right 28 and downward 29 components of the gravitational vector 24 are measured by the vehicle."

At column 5, lines 46-67, Airey describes the construction of three vectors that define a Basis Change Matrix M. Airey teaches that:

> The first step is to select a world vector as the starting point. FIG. 8 shows how a vector, CN 32, that points to magnetic north and is at a right angle to the gravitational vector is found using The Gram-Schmidt Process:
>
> CN=C-(C dotproduct G)G.
>
> This vector is converted to a unit vector N 31 pointing north:
>
> N = CN/square root of (CN dotproduct CN).
>
> The third matrix component needed to describe the world coordinate system is a simple cross-product of the gravity and north vectors:
>
> E=G x N.

It is clear from this discussion of Airey that the absence of either the gravitational vector G or the magnetic field vector C would make the entire process fail, if for no other reason than the equation

$$CN=C-(C \text{ dotproduct } G)G$$

requires values for all three components of both C and G to determine CN, the basis for at least one of the vector entries in matrix M. In other words, without values for the three components of both of vectors C and G, the apparatus and method of operation taught by Airey fails.

2. Airey is INOPERATIVE if the three axis accelerometer is omitted.

If the gravitational sensors (e.g., the three axis accelerometer) were removed from the apparatus of Airey, it would not function at all. Because Airey teaches an apparatus and method that relies on BOTH the magnetic and the gravitational fields of the planet Earth, Airey cannot be used to provide anticipation for or to make obvious an apparatus or a method

that performs functions using only one field (the magnetic field) and not the other field (the gravitational field) because Airey never explains how to perform such functions using only one of the two fields.

According to MPEP §2143.01 Suggestion or Motivation To Modify the References, in the section entitled "THE PROPOSED MODIFICATION CANNOT RENDER THE PRIOR ART UNSATISFACTORY FOR ITS INTENDED PURPOSE," Examiners are instructed that

> If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)

According to MPEP §2143.01 Suggestion or Motivation To Modify the References, in the section entitled "THE PROPOSED MODIFICATION CANNOT CHANGE THE PRINCIPLE OF OPERATION OF A REFERENCE," Examiners are instructed that

> If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)

Applicants respectfully submit that the attempt to combine only the MAGNETIC PORTION of the teaching of Airey with Keller is inappropriate in that it would render Airey inoperative, and to make only the magnetic portion an operative embodiment would change the principle of operation of Airey.

3. Airey teaches away from combining his invention with a GPS-based invention.

At column 2, lines 22-29, Airey teaches that:

> Several modern systems, for instance Gudat et al. (U.S. Pat. No. 5,838,562, 1998), use a Global Positioning System for navigation. However, even the best Global Positioning System is only accurate to about 5 meters. **Good enough to know where you are to within a city block, but not good enough to avoid obstacles or repeat a path with any accuracy.** (emphasis added)

Airey clearly indicates that GPS is insufficiently accurate to attain the goals he desires to attain. One would be hard pressed to suggest that Airey would willingly combine his invention with a GPS-based system that does not, in his perspective, add anything to accomplishing his intended goal.

4. Airey requires elements that are neither present nor required in the present invention.

In addition to use of the earth's gravitation field, which the present application does not need or use, Airey requires the use of a non-driving wheel for measuring distance traveled by his device. At column 2, line 66, through column 3, line 7, Airey teaches:

> Mechanically, the invention has two independent driving wheels that are controlled by the computer. For balance and distance measurement, at least one non-driving wheel is needed. This wheel is attached to the chassis with a caster to give it two planes of freedom. The measurement of the rotation of this passive wheel is the basis for an exact measurement of the distance traveled by the vehicle. **The driving wheels are subject to slipping and can't be use for this purpose.** (emphasis added)

The present invention uses treads, and has no non-driven wheels. Accordingly, there is no basis to assert Airey's apparatus and method as being applicable to the present invention, because elimination of the non-driven wheel either causes Airey to fail, or requires a change in the principle of operation of Airey.

5. Airey was allowed as a patent even over the admitted prior art comprising GPS navigation systems.

As indicated, Airey disclosed the existence of U.S. Patent No. 5,838,562 issued to Gudat et al. in 1998, and that patent is cited on the face of Airey as a reference of record. Applicant does not understand why Airey is combinable with a GPS-based system, from which Airey teaches away. Applicant is also surprised that the Examiner insists that the present invention is anticipated by a GPS-based system, when Airey clearly was not deemed anticipated by or obvious in light of a GPS-based system.

In particular with respect to Claim 1, the Examiner stated the following:

> Keller does not teach the compass module configured to discern an orientation relative to the magnetic field of the planet Earth. However, Keller teaches another means that perform the same function as the compass. **Therefore, they are considered functional equivalent.** See In re Brown, 459 F. 2d 531, 535, 173 USPQ 685, 688 (CCPA 1972). In re Mulder, 716 F. 2d 1542, 219 USPQ 189 (Fed. Cir. 1983). Applicant's invention uses the compass to discern orientation. Indeed, Keller's invention performs the same function with another means such as gyrocompass. Applicant's compass is in communication with other modules as well as Keller's invention. The "magnetic field of the planet Earth" only affects the compass functions, not the whole invention. Keller's invention is not affected at all by the "magnetic field of the plant Earth," because it uses another means (column 4, lines 55-67). Note, the purpose of both inventions is to discern orientation, which it is achieved in Keller's invention (figures 2a and 9b). (emphasis added)

Keller never explicitly describes the magnetic field of the planet Earth as a suitable signal from which to derive a location or a direction. Furthermore, from the disclosure of Keller previously cited in prior responses, it is clear that "GPS" systems are the primary locating system used in the invention of Keller, and other systems are provided as SUPPLEMENTAL systems, and not as the principal navigational system of Keller's invention. Keller does not teach or suggest how a system would operate without the "GPS" system he uses as the primary locating system, nor does Keller explain how to use such a system in the absence of the primary "GPS" system.

6. Applicant has previously explained that the argument by the Examiner that "Therefore, they are considered functional equivalent" is an argument that is contrary to the practice of the US Patent and Trademark Office as expressed in the Manual of Patent Examining Practice.

The full argument is given at length in the paper submitted in response to the Office Action of February 15, 2005, and will not be repeated here.

Applicant respectfully traverses the rejection.

Applicant respectfully traverses the rejection previously given as being an improper rejection. First, an entire limitation of claim 1 is nowhere addressed in the Office Action. In addition, as explained, Airey does not enable, teach or suggest the use of a compass module alone. Therefore, because neither Keller nor Airey teach or suggest "a compass module in electrical communication with said control module, said compass module configured to discern an orientation of said programmable robotic apparatus, wherein said compass module is configured to discern an orientation relative to the magnetic field of the planet Earth based on an analysis of at least one directional component of said magnetic field," independent claim 1 is neither anticipated nor made obvious by Keller or by Airey individually. *Arguendo*, even if the combination of Keller and Airey were permissible, which Applicant does not concede, since neither Keller nor Airey individually teach the use of a compass module without more, the combination of Keller and Airey cannot teach what neither teaches individually. Accordingly, Applicant respectfully traverses the rejection of independent claim 1 based on the failure of the Examiner to explain a basis for rejection of one claim limitation (or even to acknowledge the presence of the "environmental signal detection module limitation" in independent claim 1), and based on an improper combination of Keller with Airey, and further that such improper combination still fails to teach the subject matter claimed.

Applicant respectfully submits that all of pending claims 2-10 and 21-30 which depend directly or indirectly from independent Claim 1 are patentable as depending from an allowable base claim, because dependent claims include every limitation of any claim from which they depend.

Response to Rejection of Claims 5, 9, 10, 21-23, 25-30 under 35 U.S.C. §103(a)

Claims 5, 9, 10, 21-23, and 25-30 were rejected under 35 U.S.C. §103(a) as being unpatentable over Keller in view of one or more other patents or published patent applications.

Applicant has hereinabove explained why the application of Keller by the Examiner to render obvious the limitation of Claim 1 that recites "a compass module in electrical communication with said control module, said compass module configured to discern an orientation of said programmable robotic apparatus, wherein said compass module is configured to discern an orientation relative to the magnetic field of the planet Earth based on an analysis of at least one directional component of said magnetic field" (hereinafter "the compass module limitation") appears to be inappropriate according to the guidelines set forth by the MPEP. In addition, the environmental signal detection module limitation has not been addressed by the Office Action. Accordingly, since the limitations are understood to be present in every dependent claim by 35 U.S.C. §112, fourth paragraph, Applicant respectfully submits that the Examiner has not presented a proper rejection for any claim that depends from claim 1, if such rejection relies on Keller for making obvious the compass module limitation and the environmental signal detection module limitation. Accordingly, Applicant respectfully submits that all of dependent claims 5, 9, 10, 21-23, and 25-30 are allowable, because the Examiner has yet to present a suitable rejection for the compass module limitation and the environmental signal detection module limitation.

Response to Objection to Claim 24

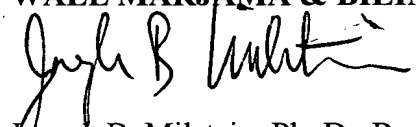
The Examiner is thanked for indicating the presence of allowable subject matter in the application. As has been discussed hereinabove, Applicant believes that base claim 1 as presently presented and intervening claims 21 and 23 should also be allowable. Accordingly, claim 24 is not amended at this time.

CONCLUSION

Applicant has explained why the rejections of claims 1-10, 21-23, and 25-30, and the objection to claim 24, appear to be improper. Applicant respectfully requests that the application be reconsidered and that the rejections of Claims 1-10, 21-23, and 25-30, and the objection to Claim 24, be withdrawn. Applicant submits that Claims 1-10, and 21-30 are now in proper condition for allowance, and requests the issuance of a Notice of Allowance at the Examiner's earliest convenience.

If the Examiner believes that contact with Applicant's attorney would be advantageous toward the disposition of this case, the Examiner is requested to call Applicant's attorney at the phone number noted below.

Respectfully submitted,
WALL MARJAMA & BILINSKI LLP

By: 

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